WIRE

PROJECT HIGHLIGHTS

Announcement of Opportunity	AO OSSA 2-88
NASA Headquarters Office	Office of Space Science
Enterprise	Space Science
Project	Wide-Field Infrared Explorer
Project Lead Center	GSFC
Management Approach	In-House
Mission Life (months)	4
Additional Data Analysis (months)	0
Launch Date	04 Mar 1999

MISSION OBJECTIVES

The objective of the WIRE mission is to answer three questions:

1. What fraction of the luminosity of the universe at redshifts of 0.5 and beyond is due to starburst galaxies?
2. How fast and in what way are starburst galaxies evolving?
3. Are luminous protogalaxies common at redshifts less than 3?

FOREIGN PARTICIPATION

None

SPACECRAFT DESCRIPTION

The spacecraft bus provides S-band coverage, transmits data acquired by the instrument, relays commands to the instrument sent by ground control, and controls the pointing of the instrument. The spacecraft structure is comprised of three decks supported by a truss structure, eight equipment panels, and eight access panels. The spacecraft measures 1.86 meters high with a diameter of 85.8 cm.

PAYLOAD DESCRIPTION

The payload contains one instrument, the Wide-Field Infrared Explorer (WIRE), a cryogenically cooled telescope that views objects in the 12-25 um band. The payload also contains a star tracker.
Instrument Descriptions and Science Leaders:

INSTRUMENT DESCRIPTIONS AND SCIENCE LEADERS

Data Point Number 809: The IR Telescope instrument (IR) [protoflight] (WIRE) The WIRE instrument consists of a 30-centimeter aperture (12.5-inch) Ritchey-Chretien Cassegrain telescope with no moving parts and a field of view about the size of the full moon. The telescope is provided by Utah State University's Space Dynamic Laboratory and is enclosed within a two-stage, state-of-the-art, solid-hydrogen cryostat designed and manufactured by Lockheed-Martin Advanced Technology Center. The WIRE cryostat uses the sublimation (transition directly from solid to gas) of frozen hydrogen to cool the telescope. The cryostat is designed like a thermos bottle, using a vacuum space between layers of insulation, to minimize heat flow to the inside. The telescope mirrors are cooled to less than 13 Kelvin (K)(-436F) and the focal plane arrays are cooled to less than 7 K (-447F) using only 4.5 kilograms (9.9 pounds) of solid hydrogen. The Boeing/Rockwell long-wave infrared detectors used by WIRE provide a two-color view of science targets at infrared wavelengths of 12 and 25 microns. WIRE is studying objects, which are colder than that - 25 mm corresponds to a temperature of about 116 K (-251 F). Perry Hacking (JPL) is the instrument PI.

GROUND SYSTEM DESCRIPTION

The SMEX Ground System consists of the Mission Operations Center (MOC), ground stations, Flight Dynamics Division (FDD), and the launch site. This architecture was developed for TRACE and is currently planned for reuse on the WIRE mission. All elements are connected by the MP&DSD Operations Development Network (MODNet). The MOC is physically divided into the Mission Operations Room (MOR) and the Mission Analysis Room (MAR). Functionally, the MOC is composed of the real-time system and the off-line system. In general, the real-time system operates in the MOR and the off-line system operates in the MAR, although there is no physical reason preventing any function being performed in any location. The real-time system is the primary FOT interface for command and control, and spacecraft health and safety monitoring. It generates commands, initiated by FOT or CMS input, and forwards them to the ground stations via Nascom, for uplink. The real-time system receives the composite telemetry stream or stripped Virtual Channels (VC) from the ground stations through Nascom. Decommutation, calibration, and limit checks are performed on the engineering telemetry stream. Engineering data storage for up to 30 days, real-time system hardware and software, and history recording capabilities are provided together with scheduling interfaces to the lead scheduler element. The off-line system consists of the Command Management System (CMS), Data Processing System (DPS), and the Attitude Determination System (ADS).

The CMS function consists of an MAR-based workstation that will provide command planning and management services. This unit, utilizing FDD, FOT, PI, flight software maintenance, and Project inputs, generates pass plans and loads needed to perform spacecraft operations. The DPS receives the composite telemetry stream from the ground stations in real time (or shortly after LOS). It is a workstation-based system that can reside either in the MOC or in the PI's Science Operations Center. It performs data quality checking, removing communications artifacts and redundant data, sorting, time ordering, assembly of the data into packets, and science data storage. The ADS is located in the MAR. It is the primary system for the analysis of Attitude Control Subsystem (ACS) data and is used by FDF to verify ACS performance and attitude solutions. The ADS also generates attitude products for the project and science team. Communications between the spacecraft and the ground facilities are provided through the Wallops Island Orbital Tracking Station (WPS) at WFF; a Wallops provided Transportable Orbital Tracking Station (TOTS) stationed at Poker Flats, Alaska; and the DSN ground stations at Goldstone (DSS-16/DSS-17), Canberra (DSS-46), and Madrid (DSS-66). DSN stations are currently used only for Launch and Early Orbit (L&EO) activities and for contingency backup support. The FDD provides orbit, attitude, mission analysis support acquisition, and scheduling data for the mission. The FDD receives tracking data from ground stations and has access to the ADS in the MAR. Although the FDD is continuously available for data receipt, FDD analysts will not provide support on a round-the-clock basis. The majority of FDD support is provided on weekdays during the prime shift.

CONTRACT AND SUBCONTRACT HISTORY

Contractor/Subcontractor	Project Element
JPL	Payload
SDL/Utah State University	IR Telescope
Rockwell Science Center	Focal Plane Arrays
Lockheed Palo Alto Research Lab	Cryogenic Cooler
Composite Optics	Solar Array Platelets and Flares
Composite Optics	Composite Structure
Tecstar, Inc.	Solar Array
Ball Aerospace & Tech	Star Tracker
Ball Aerospace & Tech	Light Shade
Ithaco, Inc	Electromagnets
Adcole, Inc	Digital Sun Sensors
Adcole, Inc	Course Sun Sensors
Textron Defense Systems	Gyros
New Mexico State University/ Physical Science Lab	ACS Hardware

LAUNCH AND MISSION ORBIT DATA

Launch Vehicle/Upper Stage	Pegasus XL	Inclination (deg)	97.56
Launch Site	Wetern Range/Vandenburg AFB	Period (min)	
Mission Orbit Type	Sun synchronous	Perigee (km)	540
		Apogee (km)	590